Project: **Microdischarge Cavity (MCD) Thruster for Small Satellites**

Advisors: Prof. Rod Burton, AE, rburton@illinois.edu. Prof. Gary Eden, ECE

Project Description: The microdischarge cavity (MCD) thruster is based on radio frequency (rf) microdischarge technology developed by Prof. Gary Eden and Dr. Sung-Jin Park in ECE over the past 10 years. Gaseous propellant flows into the microcavity, typically 100 μm diameter, and is heated by a pair of foil electrodes to gas temperatures as high as 1500 K. Nozzle technology has also been developed, which when coupled to the cavity and operated in a vacuum, can accelerate the hot gas to supersonic velocities, providing thrust. The resulting MCD thruster, weighing <100 gm with 2 mN of thrust, can provide attitude control and orbital maneuvering for small satellites.

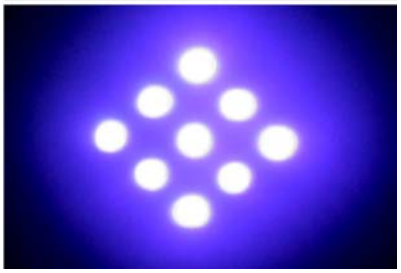

Fig. 1. Photograph of our MEMS Micro-Cavity Plasma Discharge (MCD) array, producing the blue plasma glow

The student will assist the experimental effort to develop MCD in the AE Electric Propulsion Laboratory and the ECE Optical Physics Laboratory. The AE EP Laboratory is equipped with a 1.5 m^3 high vacuum tank, thrust stand, and data acquisition equipment. Typical tasks include measurement of propellant mass flow rate, gas temperature, thrust, and input power, and development of system components such as miniature rf power supplies and gas regulators.

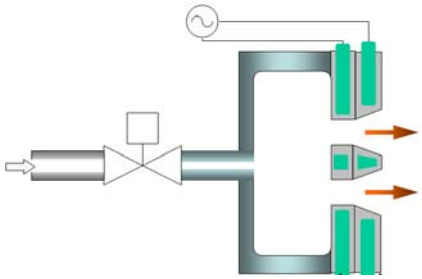

Fig. 2. Schematic of Micro-Cavity Plasma Thruster (MCDT), showing multiple nozzles and capacitively-coupled AC electrodes

Student Background: Strong interest in propulsion and fluid mechanics including compressible flow, or power/electronics. Hands-on laboratory experience.

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